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DAVID K. LUCENTE; SEAGATE TECHNOLOGY LLC  
INTELLECTUAL PROPERTY DEPT. - COL2LGL  
389 DISC DRIVE  
LONGMONT, CO 80503

EXAMINER
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WATKO, JULIE ANNE

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PAPER

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* WILLIAM LEON RUGG  
and TODD WARREN KUBE

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Appeal 2007-3183  
Application 10/602,791<sup>1</sup>  
Technology Center 2600

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Decided: November 12, 2008

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Before KENNETH W. HAIRSTON, SCOTT R. BOALICK,  
and MARC S. HOFF, *Administrative Patent Judges*.

HOFF, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF CASE

Appellants appeal under 35 U.S.C. § 134 from a Final Rejection of claims 1-6, 8-13, 16, and 20.<sup>2</sup> We have jurisdiction under 35 U.S.C. § 6(b).

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<sup>1</sup> Application filed June 24, 2003. The real party in interest is Seagate Technology LLC.

We affirm-in-part.

Appellants' invention relates to a disc drive having all of its actuator servo-controls and signal processing electronics circuitry incorporated onto a flexible printed circuit assembly positioned on a top surface of a base plate. The top cover of the drive avoids the power, actuator servo-controls and signal processing electronics components mounted on the flexible printed circuit board, so that these components may be cooled by ambient air circulation (Spec. 2).

Claims 1 and 12 are exemplary:

1. A data storage device comprising:

a base plate having a top surface;

a spindle motor positioned on the top surface of the base supporting one or more data storage discs for rotation on the spindle motor;

an actuator assembly positioned on the top surface of the base plate adjacent the data storage disc; and

a flex printed circuit board assembly on the top surface of the base plate having actuator and motor electronic control components thereon on the top surface of the base.

12. A flexible printed circuit assembly for use in a data storage device having an actuator assembly adjacent a spindle motor rotating one or more data storage disc, the assembly comprising:

a flexible printed circuit having a pigtail lead for connection to the actuator assembly of the data storage device and a pigtail lead for connection to the spindle motor of the data storage device;

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<sup>2</sup> Claims 7, 14, 15, and 17-19 stand objected to as dependent upon a rejected base claim.

actuator control and signal processing electronics components mounted on, and electrically connected to, the flexible printed circuit; and

a stiffener plate coextensive with a portion of the flexible printed circuit forming a ground plane for the components on the flexible printed circuit.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Koo	US 6,243,262 B1	Jun. 5, 2001
Bernett	US 6,388,834 B1	May 14, 2002
Crane	US 6,797,882 B1	Sep. 28, 2004 (filed Oct. 18, 2001)
Sega	EP 0 760 510 A1	Mar. 5, 1997

Claims 1, 2, 4, 5, and 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sega in view of Crane.

Claims 3 and 9-11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sega in view of Crane and Koo.

Claims 6, 12, and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sega in view of Crane and Bennett.

Claims 16 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bennett in view of Crane.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Appeal Brief (filed January 29, 2007) and the Answer (mailed February 12, 2007) for their respective details.

## ISSUE

There are two principal issues in the appeal before us.

The first issue is whether the Examiner erred in finding that Sega in combination with Crane teaches a data storage device having a flex printed circuit board assembly, with actuator and motor electronic control components thereon on the top surface of the base.

The second issue is whether the Examiner erred in finding that Sega in combination with Crane and Bennett teaches a stiffener plate forming a ground plane for the components, or connected to the components, on a flexible printed circuit.

## FINDINGS OF FACT

The following Findings of Fact (FF) are shown by a preponderance of the evidence.

### *The Invention*

1. According to Appellants, the invention relates to a disc drive having all of its actuator servo-controls and signal processing electronics circuitry incorporated onto a flexible printed circuit assembly positioned on a top surface of a base plate (Spec. 2).

2. The top cover of the drive avoids the power, actuator servo-controls and signal processing electronics components mounted on the flexible printed circuit board, so that these components may be cooled by ambient air circulation (Spec. 2).

*Sega*

3. Sega teaches a magnetic disk device capable of achieving a large capacity with a small and thin structure, and having a good seal for the magnetic disk portion, thereby ensuring a high reliability of the device (col. 3, ll. 30-35).

*Crane*

4. Crane teaches an economical die package for connecting to a substrate, such as a printed circuit board or a flexible printed circuit (col. 2, ll. 33-35).

5. Crane teaches replacing a printed circuit board with a flexible circuit board and a stiffener (col. 9, ll. 53-58).

*Koo*

6. Koo teaches providing a sound muffling and heat-discharging case for a computer storage apparatus capable of effectively processing noise and heat occurring from a hard disk drive (col. 2, ll. 46-49).

7. Koo teaches that non-enclosed circuit parts advantageously discharge heat when externally exposed (col. 4, ll. 1-8).

8. Koo explicitly shows that heat-generating circuit elements 300a are disposed outside a cutout region of a cover for a hard disk drive, such that excess heat may be discharged (Koo Figs. 3, 4).

*Bernett*

9. Bennett teaches an apparatus and method for reducing the transmission of electromagnetic interference (EMI) noise originating within a disc drive (col. 2, ll. 28-31).

10.     Bernett teaches that bracket 166 provides an alternative pathway for EMI noise between cover 104 and base 102 (col. 5, ll. 11-13) and “reduces the transmission of EMI noise to the flex circuit 132” (col. 5, l. 43).

## PRINCIPLES OF LAW

“Section 103 forbids issuance of a patent when ‘the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.’” *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S. Ct. at 1734 (“While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.”)

In *KSR*, the Supreme Court emphasized “the need for caution in granting a patent based on the combination of elements found in the prior art,” *id.* at 1739, and discussed circumstances in which a patent might be determined to be obvious. In particular, the Supreme Court emphasized that “the principles laid down in *Graham* reaffirmed the ‘functional approach’ of *Hotchkiss*, 11 How. 248.” *KSR*, 127 S. Ct. at 1739 (citing *Graham v. John*

*Deere Co.*, 383 U.S. 1, 12 (1966) (emphasis added)), and reaffirmed principles based on its precedent that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *Id.* The Court explained:

When a work is available in one form of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

*Id.* at 1740. The operative question in this “functional approach” is thus “whether the improvement is more than the predictable use of prior art elements according to their established functions.” *Id.*

One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). The test of obviousness is what the combined teachings would have suggested to those of ordinary skill in the art. *Id.* at 425.

## ANALYSIS

### *Claims 1, 2, 4, 5, and 8*

We select claim 1 as representative of this group, pursuant to our authority under 37 C.F.R. § 41.37(c)(1)(vii).

Appellants argue that the combination of *Sega* and *Crane*, asserted by the Examiner, cannot render obvious the claimed subject matter because: (a)



the references do not disclose the elimination of a printed circuit board in a disc drive (Br. 9); (b) Sega teaches electronic components mounted on both sides of its printed circuit board, which would be a functional impossibility if Sega were modified to use a flex circuit with a stiffener (Br. 9); and (c) the Examiner allegedly failed to produce evidence to support her rationale that the proposed modification would simplify assembly by eliminating a connection step (Br. 10).

We are not persuaded by Appellants' arguments. We concur in the Examiner's findings that Sega teaches all the features of the claimed invention, save for replacing a conventional printed circuit board with a combination of a flexible circuit board and a stiffener (Ans. 3-4), and that Crane teaches replacing a printed circuit board with a flexible circuit board and a stiffener (FF 5). We agree with the Examiner's conclusion, supported by her cited evidence in Crane and Greenside (Ans. 10-11), that such a modification would be advantageous in order to eliminate a potentially deleterious connection step (Ans. 10).

The proposed "elimination of a printed circuit board within a disc drive," which Appellants allege to be absent from the Examiner's rejection, is in fact precisely what the Examiner's asserted combination of references is intended to accomplish. The Examiner need not supply a single reference containing that precise teaching, provided that the Examiner proposes a legally proper combination of references under § 103. Similarly, the alleged impossibility of mounting components on both sides of the circuit board is not germane to the claimed invention, because the claims do not require components to be mounted on both sides. We further agree with the

Examiner's position that Sega does not teach away from the proposed modification (Ans. 13).

Because we find that Sega in combination with Crane teaches every element of the claimed invention, we do not find error in the Examiner's rejection of claims 1, 2, 4, 5, and 8 under 35 U.S.C. § 103(a).

*Claims 3 and 9-11*

We select claim 3 as representative of this group, pursuant to our authority under 37 C.F.R. § 41.37(c)(1)(vii).

Appellants argue that the Examiner's rejection is erroneous because Koo does not remedy the asserted deficiencies of Sega and Crane with respect to the provision of a flex printed circuit board (Br. 12). As explained *supra*, we find that the combination of Sega and Crane does teach a flex printed circuit board having a stiffener.

Appellants further argue that the Examiner's rejection is in error because Koo fails to teach that "the actuator and motor electronic control components on the flex printed circuit board assembly are outside the enclosed space," as required by claim 3, and that it is "difficult to imagine why Koo would then proceed to place heat-generating components outside the cutout" (Br. 11-12). We find Appellants' argument unpersuasive because the Examiner has established that Koo teaches that non-enclosed circuit parts advantageously discharge heat when externally exposed (Ans. 19; FF 7), and that Koo explicitly shows that heat-generating circuit elements 300a are disposed outside a cutout region of a cover for a hard disk drive, such that excess heat may be discharged (FF 8). We concur in the Examiner's rationale that it would have been obvious to locate the actuator

and motor control components outside the enclosed space, in order to discharge heat, as Koo teaches (Ans. 6).

Because the Examiner has established that Sega in combination with Crane and Koo fully meets the claimed invention, we do not find error in the rejections of claims 3 and 9-11.

*Claims 6, 12, and 13*

Appellants allege error in the Examiner's rejection of these claims because the grounding apparatus of Bennett does not correspond to "a ground plane for the components on the flexible printed circuit," as claim 12 requires, nor does Bennett disclose a stiffener that "forms a ground plane for the circuitry on the flexible printed circuit," as claim 6 requires (Br. 12-13). In the Examiner's view, Bennett's grounding flex circuit support bracket 166 (Figs. 6-8; hereinafter, "bracket 166"), which establishes grounding contact between a disc drive's base and cover, forms a ground plane "insofar as the stiffener grounds the base and the cover," and the stiffener is "'for the components'" "insofar as the stiffener ... protects the circuitry from EMI noise" (Ans. 20).

We are not in agreement with the Examiner's position. The Examiner concedes that Sega [and Crane] are silent regarding whether the stiffener is metal and forms a ground plane for the circuitry on the flexible printed circuit, as claim 6 requires (Ans. 6). For bracket 166 to serve as a ground plane for the circuitry on the flexible printed circuit (132), it must provide an electrically conductive path to ground for that circuitry. We have reviewed Bennett and can find no teaching that such an electrical path is provided. Bennett teaches only that bracket 166 provides an alternative pathway for

EMI noise between cover 104 and base 102 and “reduces the transmission of EMI noise to the flex circuit 132” (FF 10).

Similarly, we can find no teaching that Bennett’s bracket 166 forms a ground plane for the components on the flexible printed circuit, as claim 12 requires.

We therefore find error in the Examiner’s rejection of claims 6 and 12, as well as claim 13 dependent upon claim 12, under 35 U.S.C. § 103(a).

*Claims 16 and 20*

Claim 16 requires “a stiffener plate coextensive with a portion of the flexible printed circuit forming a ground plane connected to the one or more components.” As discussed with respect to claims 6 and 12, *supra*, Bennett’s bracket 166 does not teach the formation of a ground plane, *i.e.*, an electrical path to ground, for the components on the flexible printed circuit. We therefore find error in the Examiner’s rejection of claim 16, and claim 20 dependent therefrom, under 35 U.S.C. § 103(a).

CONCLUSION OF LAW

We conclude that Appellants have not shown that the Examiner erred in rejecting claims 1, 2, 4, 5, and 8. Claims 1, 2, 4, 5, and 8 are not patentable.

We conclude that Appellants have not shown that the Examiner erred in rejecting claims 3 and 9-11. Claims 3 and 9-11 are not patentable.

We further conclude that Appellants have shown that the Examiner erred in rejecting claims 6, 12, 13, 16, and 20. On the record before us, claims 6, 12, 13, 16, and 20 have not been shown to be unpatentable.

DECISION

The Examiner's decision rejecting claims 1, 2, 4, 5, and 8 is affirmed.  
The Examiner's decision rejecting claims 3 and 9-11 is affirmed. The  
Examiner's decision rejecting claims 6, 12, 13, 16, and 20 is reversed.

No time period for taking any subsequent action in connection with  
this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

KIS

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